Final Report for the Project: Etiology and Management of a Mature Watermelon Vine Decline Disease in Southern Indiana

651 1155-0825/proposal DK61

Daniel S. Egel, Harikrishnan Ramasubramaniam, Karen Rane, Rick Latin, and Ray D. Martyn
Department of Botany and Plant Pathology
Purdue University

Summary

Mature watermelon vine decline (MWVD), a newly described disease of watermelon, has been observed in southwestern Indiana. Severe in the years 1989, 1995, 1999 and 2000, mature watermelon vine decline causes a wilt and general decline of watermelon plants. Below ground symptoms include a sparse root system with necrotic primary rots and few secondary roots.

Initial research efforts have concentrated on determining what, if any biological factors are involved in MWVD. Greenhouse experiments were conducted with soil from commercial watermelon fields with a history of MWVD. Plants grown in non-fumigated soil exhibited typical MWVD symptoms of wilt and root necrosis. In contrast, plants grown in fumigated soil failed to show MWVD symptoms. Our conclusion is that MWVD symptoms are caused by a biological factor(s) in the soil such as soil fungi.

A series of greenhouse experiments were conducted to determine if any other vegetable crop is susceptible to MWVD. In three different greenhouse experiments with soil from a commercial watermelon field with a history of MWVD, only watermelon exhibited MWVD symptoms. Crops that failed to display MWVD symptoms in these greenhouse experiments included muskmelon, squash, pumpkin, pepper and tomato. These results confirmed field observations that only watermelon is susceptible to MWVD.

Two of the above experiments also included a normal and high water treatment. Plants in the normal water treatment were watered to achieve growth. The plants grown in the high water treatment were saturated at weekly intervals for 10 to 12 hour intervals. The plants in the wet treatment exhibited more severe symptoms of MWVD than did plants that were watered normally. These results help explain field observations that high soil water levels are associated with MWVD.

Several types of soil fungi have been isolated from the roots of MWVD affected

The pathogenicity of *Pythium aphanidermatum* against watermelon roots has been tested in greenhouse experiments. In initial experiments, *P. aphanidermatum* has been shown to cause root necrosis and a plant wilt similar to MWVD. In addition, muskmelon plants in the same experiments do not appear to be as severely affected by *P. aphanidermatum* as watermelon. Thus, *P. aphanidermatum* may play a role in causing the MWVD symptoms of wilt and root necrosis.

Grower Recommendations

1. Fumigation—Greenhouse experiments have shown that thorough soil fumigation eliminates the soil factors that cause MWVD. Thus, effective soil fumigation in a commercial watermelon field will help to reduce MWVD symptoms.

   MWVD has been observed in fumigated commercial watermelon fields. However, since commercial fumigations normally only treat the area under the plastic, large areas of the field remain untreated. Roots may explore soil that has not been fumigated or fungi may recontaminate the treated zone after fumigation.

   Commercial fumigations may be ineffective if soils do not meet the proper temperature and moisture conditions. Equipment failure and operator error can also lead to ineffective soil fumigations.

2. Rotation-In our research, only watermelon has shown symptoms of MWVD. It follows then, that repeated planting of watermelon may lead to a build up of the fungi that cause MWVD. Long rotations of 5 or 6 years between cucurbit crops is recommended for soil borne organisms, such as the ones that are involved in MWVD. Standard rotations of at least 2 years between cucurbit production is still a prudent practice to manage foliar diseases.

3. Water management-We have been able to reproduce MWVD symptoms in the greenhouse when plants were grown in soil saturated with water. Therefore, water management may play a critical role in MWVD control. Watermelon growers should avoid practices which lead to saturated soils. Care should be used when irrigating vines. This is especially true when fruit are rapidly increasing in size on the vines.

4. Water management is closely tied to soil type; heavier soils are more likely to become saturated and therefore more likely to have MWVD problems. Fields with heavier soils or which have a history of MWVD problems should be avoided; if such fields must be used, longer rotations should be used and water